Trend Study 25A-7-04

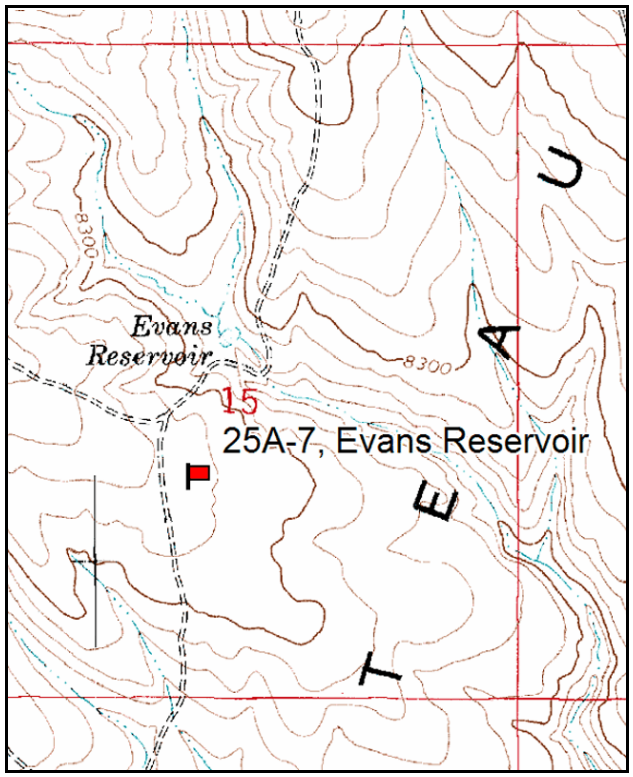
Study site name: Evans Reservoir . Vegetation type: Harrowed Big Sagebrush .

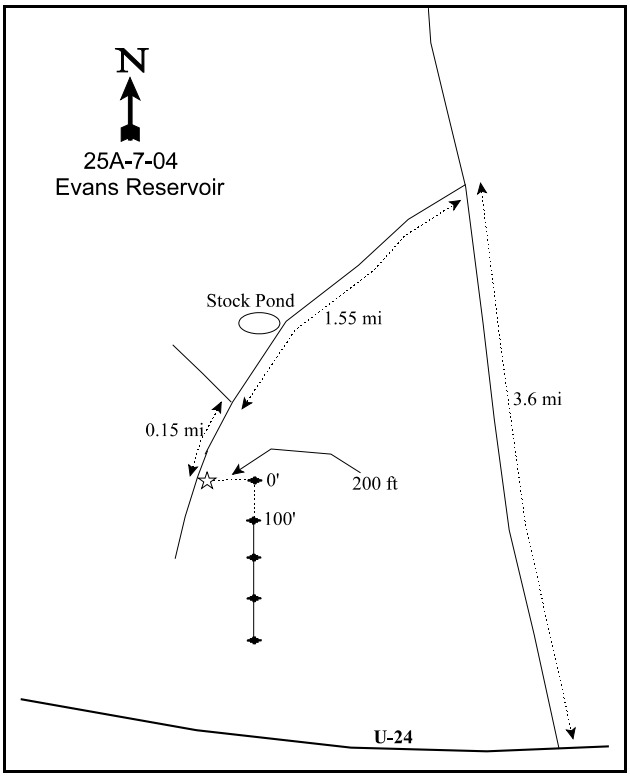
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Heading northwest out of Loa on U-24, turn right at mile marker 45. Go 3.5 miles to a green and yellow fence post on the left (20 feet off the road). Continue about 0.1 miles past the fence post and turn left. Go 1.55 miles past a stock pond and up to a fork. Turn left at the fork and go 0.15 miles to a steel rebar witness post on the left side of the road. From the witness post, walk 200 feet east to the 0-foot baseline stake, a rebar with browse tag #7122.





Map Name: Abes Knoll, Utah

Diagrammatic Sketch

Township 27S , Range 1E , Section 15

GPS: NAD 27, UTM 12S 4256930 N, 431157 E

DISCUSSION

Evans Reservoir - Trend Study No. 25A-7

The Evans Reservoir study is located on one of the open rolling ridges of the Awapa Plateau at an elevation of 8,300 feet. The transect is on a relatively flat ridge top within a sagebrush-grass community with a slope of about 6% and a northeast aspect. The area was two-way Dixie harrowed and fourteen species were seeded in the fall of 1999. The first 100 feet of the baseline was harrowed in the fall of 1998. The immediate area around the transects stakes were avoided. Sheep graze the area in the spring and fall as part of the Fishlake allotment. Wildlife use is predominately pronghorn antelope, although mule deer will use the site during some winters. Both antelope and sage grouse were observed in the area in 1991. Pellet group data from 1999 estimated 51 elk (126 edu/ha) and 16 deer and pronghorn (combined) days use/acre (40 days use/ha) with most of this probably coming from antelope. The pellets from these two species were difficult to distinguish differences. Sage grouse droppings were also encountered in 1999. Rabbit use is high in the area as well with over 200 groupings sampled in 1999. Pellet group data from 2004 estimated 25 elk (63 edu/ha) and 19 deer/pronghorn days use/acre (48 ddu/ha). Evans Reservoir, a small stock pond located 1/4 mile to the north, is an important water source for the area.

Soils are densely compacted and relatively shallow with an estimated effective rooting depth of only 9 inches. Texture is a sandy loam with a neutral pH (7.1). Soil organic matter is low at 1.7% and phosphorus is slightly low at 8.8 ppm. Values below 10 ppm may limit normal plant growth and development. A calcium carbonate layer is present within the profile at about 10 inches below the surface, which could be restrictive to root development. The vegetation is widely dispersed, with little bare soil sampled in 1985. By 1991, bare soil was estimated at 23% which is probably an overestimation as bare ground dropped to 11% in 1999 and was at 17% in 2004. Pavement cover has been high in all years and averages 32%. Vegetation and litter cover together provide 55% of the cover at the site. There is some evidence of wind erosion and wind-scoured depressions, with slight pedestaling occurring around the base of sagebrush. The erosion condition class determined soil movement as stable in 2004.

Browse composition is dominated by a mix of mountain big sagebrush and black sagebrush. Mountain big sagebrush density was estimated at 6,266 plants/acre in 1985, 4,732 plants/acre in 1991, 4,360 plants/acre in 1999, and dropped to 1,620 plants/acre in 2004 due to the two-way harrow treatment. The harrow treatment appears to have been done in patches, leaving some mature plants. The mountain big sagebrush has shown moderate to heavy use in the past three sampling years, but in 2004 it dropped to light to moderate use. Generally vigor has been good, but percent decadency has been high at 28% in 1991, 53% in 1999, and 31% in 2004. Much of this decadency is due to plants that were damaged by the pipe harrowed.

Black sagebrush is second in abundance to mountain big sagebrush. Its density was estimated at 3,733 plants/acre in 1985, 2,666 in 1991, 4,140 in 1999, and then decreased to 1,820 in 2004. Decreases from 1999 to 2004 were due to the two-way harrow treatment. Black sagebrush consists mostly of mature (80%) and decadent plants (14%). Decadency has decreased over the years from 59% in 1985, to 47% in 1991, to 43% in 1999 and finally with the harrow treatment to 14% in 2004. Use has been light to moderate in the past and only light use in 2004. Young recruitment is low, but seedling production increased in 2004 to 360 seedlings/acre.

Perennial native grasses dominate the understory by providing 36% of the total vegetation cover in 1999 and 59% in 2004. Mutton bluegrass and bluebunch wheatgrass are the most abundant, but other native species include: pinewoods needlegrass, blue grama, bottlebrush squirreltail, and a Carex. The two-way harrow treatment appears to have seeded crested wheatgrass and intermediate wheatgrass, although they only appear at relatively low values. Grasses make up a small percentage of the diet of antelope in Utah except during the new flush of growth each spring. The forbs observed are quite diverse, but with low quadrat frequencies.

Antelope are known to utilize some of these in summer, especially *Astragalus sp., Lotus sp., Eriogonum racemosum,* and *Linum lewisii* (Smith and Beale 1980). Smith and Beale (1980) also thought that antelope on the Awapa Plateau may feed on the abundant lichens. The most abundant forbs are timber poisonvetch and desert phlox, which provided 73% of the forb cover in 1999 and 57% in 2004. Many of the seeded species were not observed or only in very low numbers.

1985 APPARENT ASSESSMENT OF TREND

Soil trend appears stable. There is little erosion because of the pavement and litter cover. The data indicate a downward vegetative trend. There are few young or seedlings in the mountain big sagebrush or black sagebrush populations with their form and vigor appearing to decline. Several increaser species, narrowleaf low rabbitbrush, broom snakeweed, pricklypear cactus, and desert phlox are present in rather low numbers, although they could increase with a decline of the sagebrush population. The grasses appear stable.

1991 TREND ASSESSMENT

Soil trend appears to be slightly down. Pavement and rock cover declined from 55% to 37%, while cover for bare ground increased from 8% to 23%. Litter cover increased slightly. The key browse species, mountain big sagebrush, did decrease in density since 1985 by 24%, while percent decadency decreased from 47% to 28%. However, 60% of the decadent plants (1,333 plants/acre) were classified as dying. The percentage of the population in the young and mature age classes improved respectively from 3% to 10% and 50% to 62%. Another important aspect of this population is that with the decrease in density which was already too high, shrub size for mature plants has increased for both width and height. The effective volume of each plant, on average, has almost doubled. Trend for browse would be considered slightly down. The herbaceous understory trend is improved. Bluebunch wheatgrass was not even recorded in 1985, but it now has a quadrat frequency of 27%. Mutton bluegrass, bottlebrush squirreltail, and pinewoods needlegrass have increased also. They had quadrat frequency changes respectively of 63% to 76%, 28% to 50%, and 39% to 68%. Most of the forbs also had increasing quadrat sum of frequency values.

TREND ASSESSMENT
soil - down slightly (2)
browse - down slightly (2)
herbaceous understory - up slightly (4)

1999 TREND ASSESSMENT

Trend for soil is slightly improved. Vegetation and litter cover combined provide more than 60% of the cover. Relative percent bare ground has decreased from 23% to 11%. Pavement cover is moderately high at 25%, although it was at 33% at the last reading. Erosion is minimal with the gentle slope. Trend for the key browse is slightly down. Mountain big sagebrush looks to decrease in the future with a high rate of decadent plants (53%), and more decadent dying plants than young in the population. Use continues to be moderate to heavy. Black sagebrush also shows high decadency at 43%, with 56% of these classified as dying. Nearly one-fourth of the population displays poor vigor. Recruitment and seedling production of black sagebrush are low. Trend for the herbaceous understory is slightly down. Sum of nested frequency for perennial grasses and forbs decreased by 17% in 1999. The Desirable Components Index rated this site as fair with a score of 66 due to high shrub decadency, few young shrubs, but good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down slightly (2)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 66 (fair) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Relative percent bare ground cover increased slightly from 11% to 15%. Rock and pavement remained fairly constant. Protective cover and rock/pavement provide good soil erosion protection. Trend for key browse mountain big sagebrush and black sagebrush is down. Both species decreased substantially in density due to the two-way harrow treatment. Use decreased on both species, although vigor appears to be better than previous years. The harrow treatment removed many of the decadent shrubs decreasing percent decadence for both species. Trend for herbaceous understory is stable. Some of the native species had increases in their nested frequency values, but overall, there was almost no change in the values for perennial grasses which contribute to 85% of the perennial herbaceous cover. Seeded grasses are at relatively low values and contribute little to overall cover. Forbs are diverse and contribute to 15% of the herbaceous cover. The Desirable Components Index rated this site as fair with a score of 57 due to reduced shrub cover, moderate shrub decadency, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - stable (3)
winter range condition (DC Index) - 57 (fair) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 25A, Study no: 7

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron cristatum	a-	a-	a-	b19	-	.28
G	Agropyron intermedium	-	-	-	-	-	.00
G	Agropyron spicatum	a2	b51	c127	c116	4.24	6.28
G	Agropyron trachycaulum	-	-	-	3	-	.03
G	Bouteloua gracilis	37	40	50	39	.65	.75
G	Carex spp.	6	4	18	19	.56	.29
G	Oryzopsis hymenoides	-	2	7	3	.33	.06
G	Poa fendleriana	a136	ab168	ab139	b178	4.73	8.13
G	Poa secunda	b44	a16	a10	a4	.09	.04
G	Sitanion hystrix	b62	c119	a25	ab45	.71	1.11
G	Stipa comata	-	-	5	7	.21	.24
G	Stipa pinetorum	a81	c142	b97	a47	1.47	1.64
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		368	542	478	480	13.02	18.89

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
Total for Grasses		368	542	478	480	13.02	18.89
F	Androsace septentrionalis (a)	-	-	$_{b}$29	$_{a}$5	.19	.01
F	Arabis demissa	$_{b}$62	$_{a}$19	$_{a}$3	$_{a}$6	.00	.01
F	Astragalus convallarius	$_{a}$6	$_{a}$14	$_{c}$71	$_{b}$39	2.23	.31
F	Aster spp.	-	1	-	-	-	-
F	Astragalus spp.	1	-	-	-	-	-
F	Castilleja chromosa	-	5	-	-	-	-
F	Chaenactis douglasii	-	3	8	-	.02	-
F	Comandra pallida	-	-	4	2	.06	.03
F	Cryptantha spp.	$_{b}$58	$_{b}$68	$_{a}$17	$_{a}$19	.25	.16
F	Eriogonum alatum	-	-	2	-	.00	-
F	Erigeron pumilus	$_{a}$3	$_{a}$1	$_{ab}$5	$_{b}$12	.01	.13
F	Eriogonum racemosum	-	-	1	3	.01	.06
F	Eriogonum umbellatum	14	11	10	4	.21	.09
F	Gayophytum ramosissimum(a)	-	-	$_{a}$-	$_{b}$19	-	.06
F	Lappula occidentalis (a)	-	-	-	8	-	.02
F	Lactuca serriola	-	3	-	-	-	-
F	Linum lewisii	$_{a}$1	$_{a}$17	$_{b}$29	$_{a}$1	.30	.00
F	Lotus utahensis	$_{c}$55	$_{a}$-	$_{b}$16	$_{b}$16	.36	.80
F	Penstemon comarrhenus	-	-	-	1	-	.03
F	Phlox austromontana	$_{a}$67	$_{b}$130	$_{ab}$101	$_{ab}$100	1.83	1.67
F	Phlox longifolia	$_{b}$9	$_{b}$19	$_{a}$-	$_{b}$9	-	.03
F	Sanguisorba minor	$_{b}$6	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Senecio multilobatus	$_{a}$3	$_{b}$61	$_{a}$6	$_{a}$-	.05	-
F	Streptanthus cordatus	-	5	-	2	-	.03
F	Trifolium spp.	$_{a}$-	$_{b}$13	$_{a}$5	$_{a}$2	.01	.01
F	Unknown forb-perennial	$_{b}$20	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Zigadenus paniculatus	2	-	-	-	-	-
Total for Annual Forbs		0	0	29	32	0.19	0.09
Total for Perennial Forbs		307	370	278	216	5.38	3.40
Total for Forbs		307	370	307	248	5.57	3.49

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 25A, Study no: 7

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia nova	65	42	6.79	2.40
B	Artemisia tridentata vaseyana	85	47	9.89	3.47
B	Chrysothamnus viscidiflorus viscidiflorus	30	42	.46	1.54
B	Coryphantha vivipara	1	0	-	-
B	Eriogonum corymbosum	1	2	.03	.03
B	Eriogonum microthecum	3	13	.06	.18
B	Gutierrezia sarothrae	1	24	-	.91
B	Kochia prostrata	0	0	-	.02
B	Leptodactylon pungens	18	25	.09	.23
B	Opuntia spp.	1	0	-	-
B	Tetradymia canescens	0	2	-	-
Total for Browse		205	197	17.33	8.82

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 7

Species	Percent Cover '04
Artemisia nova	3.54
Artemisia tridentata vaseyana	5.09
Chrysothamnus viscidiflorus viscidiflorus	2.26
Eriogonum microthecum	.16
Gutierrezia sarothrae	1.03
Leptodactylon pungens	.25

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 7

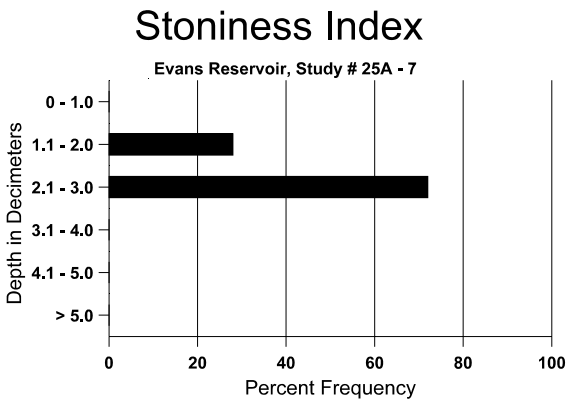
Species	Average leader growth (in) '04
Artemisia tridentata vaseyana	2.0

BASIC COVER --
Management unit 25A, Study no: 7

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	11.00	8.75	35.34	32.10
Rock	0	4.00	1.35	2.43
Pavement	54.75	33.00	25.01	31.26
Litter	26.25	30.25	25.26	31.07
Cryptogams	.50	1.00	.08	.03
Bare Ground	7.50	23.00	10.93	16.96

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 7, Study Name: Evans Reservoir

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
9.3	56.0 (8.3)	7.1	59.3	21.4	19.3	1.7	8.8	217.6	1.2



PELLET GROUP DATA --
Management unit 25A, Study no: 7

Type	Quadrat Frequency	
	'99	'04
Rabbit	45	53
Grouse	2	2
Elk	38	14
Deer	5	18
Antelope	1	3

Days use per acre (ha)	
'99	'04
-	-
26 (65)	-
51 (126)	25 (63)
16 (40)	15 (36)
-	5 (12)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	**3733**	200	133	1400	2200	-	36	54	59	3	11	10/9
91	**2666**	-	-	1400	1266	-	75	0	47	7	23	8/16
99	**4140**	80	240	2100	1800	320	44	1	43	24	24	11/19
04	**1820**	360	100	1460	260	260	0	0	14	4	4	8/16
Artemisia tridentata vaseyana												
85	**6266**	533	200	3133	2933	-	68	11	47	.63	9	15/21
91	**4732**	266	466	2933	1333	-	49	34	28	5	17	18/26
99	**4360**	-	440	1600	2320	580	62	10	53	13	15	17/29
04	**1620**	440	120	1000	500	680	12	6	31	7	11	14/23
Chrysothamnus viscidiflorus viscidiflorus												
85	**1066**	133	-	733	333	-	0	0	31	-	6	5/4
91	**332**	-	133	133	66	-	20	20	20	6	20	5/6
99	**1220**	-	100	1060	60	20	0	0	5	-	0	8/10
04	**1540**	160	20	1500	20	-	0	0	1	-	0	9/15
Coryphantha vivipara												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	2/4
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Eriogonum corymbosum												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	20	20	-	-	0	0	-	-	0	7/6
04	**60**	-	-	60	-	-	33	0	-	-	0	9/12
Eriogonum microthecum												
85	**400**	-	-	400	-	-	0	0	-	-	0	7/5
91	**466**	-	133	333	-	-	57	29	-	-	0	5/7
99	**80**	-	-	80	-	-	25	0	-	-	0	4/4
04	**440**	-	20	420	-	-	0	5	-	-	0	7/11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	3/7
04	**920**	100	-	920	-	20	0	0	-	-	0	9/13
Kochia prostrata												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	360	-	-	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**600**	-	40	560	-	-	0	0	0	-	0	6/7
04	**820**	-	60	720	40	20	0	0	5	5	5	6/10
Opuntia spp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	0	-	-	0	5/13
04	**0**	-	-	-	-	-	0	0	-	-	0	6/9
Symphoricarpos oreophilus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	11/27
Tetradymia canescens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**80**	-	60	20	-	-	0	0	-	-	0	4/5